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The Influence of the Ice in Davis Strait on the Weather of the British Isles

The publication by the Danish Meteorological Institute* of a study of the variations of ice conditions in Davis Strait affords an opportunity of investigating the bearing of this distant region on the subsequent distribution of pressure in the neighbourhood of the British Isles. The severity of the ice conditions was estimated from six different criteria on a scale of 0-10, the average figure for the whole series of years being 4·94.

In order to obtain conformity with a general investigation into the effect of ice conditions, only the 33 years 1895 to 1927 were utilised. The ice figures were correlated with overlapping three-monthly means of pressure at nine stations, beginning with July to September of the ice year, and continuing to the end of the second year. Some of the results are shown in fig. 2. In studying this figure it must be remembered that the pressure data employed are overlapping means of three months. If any isolated month has by accident a high correlation with the ice data, this will appear as a hump on the curve covering three months only, and such a hump may have no real significance. On the other hand, there is practically no correlation between the pressures in successive three-monthly periods,† so that a

*Meddelelser No. 8. The state of the ice in Davis Strait, 1820-1930. By C. I. H. Speerschneider. København, 1931.

†See *Meteorological Magazine*, 63, 1928, p. 44.

(99489) 107/27 1,050 8/32 M. & S. *Gp.303*

hump or trough extending over four or more months probably indicates a real relationship.

The first point to notice is that towards the end of the year to which the ice measurements refer, there is negative correlation between ice and pressure at Stykkisholm in Iceland, and positive correlation between ice and pressure at Bergen, Paris, Berlin, and to a less extent, Gibraltar. In other words, with much ice in Davis Strait, the Icelandic low tends to increase in intensity, while pressure tends to be above normal over the whole of western Europe.

The curve for Stykkisholm in fig. 2 is persistently low over a period of six months, so that by the criterion given above, the deepening of the Icelandic low in years of much ice is probably real, but the west European hump extends over only three months and may be accidental. The physical relationship involved is fairly clear; much ice to the west of Greenland displaces the low pressure to the eastward and concentrates it over Iceland. In the second half of the following year there is a prolonged hump over western and central Europe, extending from Bergen in the north to Gibraltar in the south, and from Valentia in the west at least as far as Berlin in the east; at Paris in the centre of this region the correlation coefficient rises to + 0·57 in August to October. This feature is probably real, but the isolated dip at Ponta Delgada may be accidental. The average change of pressure corresponding with an increase of Davis Strait ice from a scale value of 1 to 10 is shown in fig. 1.

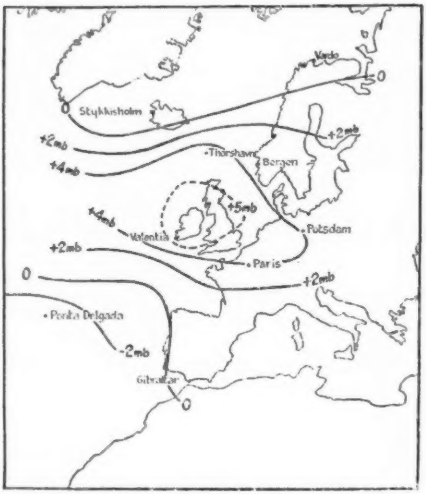


FIG. 1.

It is not easy to see in what way an excess of ice in Davis Strait can bring about an excess of pressure in western Europe late in the following year, but possibly the sequence may be somewhat as follows:—In a year of much Davis Strait ice, owing to the deepening of the Icelandic low there is a tendency for

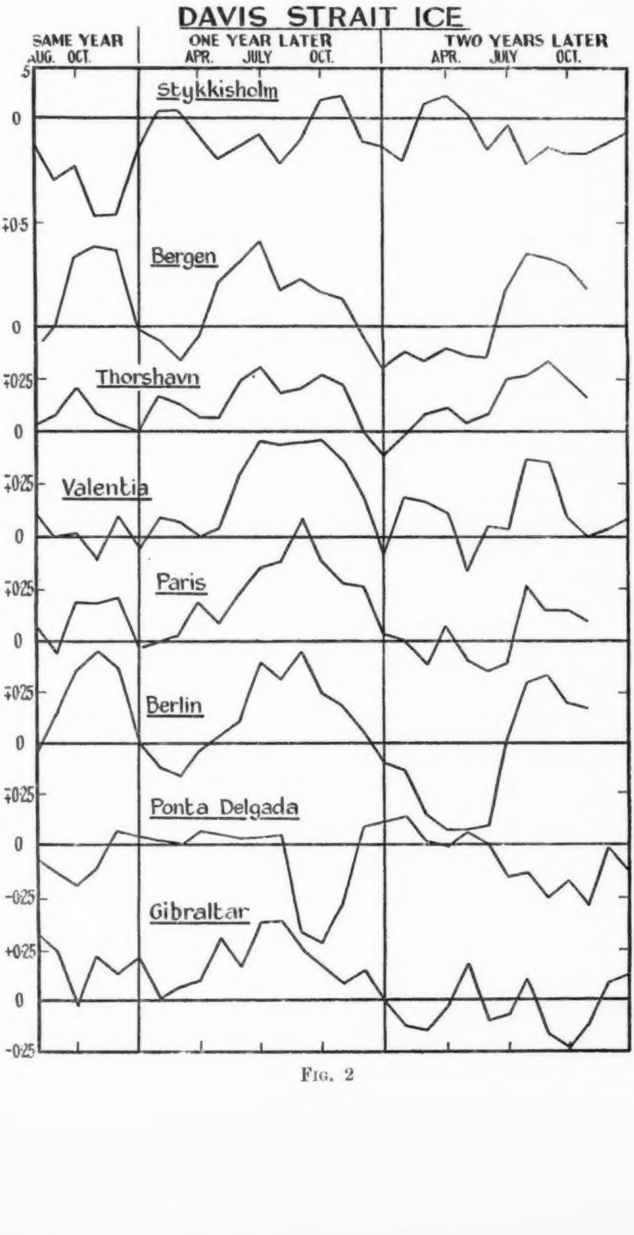

DAVIS STRAIT ICE
SAME YEAR
AUG. OCT.
ONE YEAR LATER
APR. JULY OCT.
TWO YEARS LATER
APR. JULY OCT.
Stykkisholm
Bergen
Thorshavn
Valentia
Paris
Berlin
Ponta Delgada
Gibraltar

Fig. 2

strong south-westerly winds in autumn between Iceland and Norway. These drive much relatively warm water into the basin of the Arctic Ocean, so that the body of the ocean beneath the ice becomes warmer than usual. In winter and spring this warm water, shut off from the air by the ice cover, is unable to exercise any appreciable effect, but it facilitates the break-up of the ice in the following summer (the correlation between Davis Strait ice and Arctic ice in the following year is −0·41). A warm Arctic ocean tends to give stormy conditions and low pressure in high latitudes, while the evacuated air is deposited further south and causes a belt of high pressure over Europe. In support of this tentative explanation it may be remarked that the correlation between pressure at Vardo, in the extreme north of Europe, and Davis Strait ice in the preceding year, is persistently negative, though not large.

After the period shown in fig. 1, the correlation coefficients are mostly small and irregular, and it is not probable that the direct influence of Davis Strait ice can be traced further. I wish to acknowledge the assistance of Mr. F. Metcalfe in calculating the coefficients referred to above.

C. E. P. Brooks.

Summer Weather in Ungava Bay

A summary of the meteorological work of the Oxford Hudson Strait (1931) *Expedition and a commentary on the report of Mr. A. J. G. Langley.*

By S. T. A. Mirrlees, M.A.

During the summer of 1931 the "Oxford Hudson Strait Expedition" spent parts of August and September on Akpatok Island, lat. 60°20′N., long. 67°56′W., a little-frequented island in the north-western part of Ungava bay, the southward extension of the eastern part of Hudson strait. The hydrographical and meteorological work of the expedition, which was in the charge of Mr. A. J. G. Langley, included a fairly extensive programme of meteorological observations, eye observations being made at three fixed hours daily and autographic records maintained of pressure, temperature and humidity. The various records were kindly lent by the Oxford University Exploration Club to the Meteorological Office, and in view of the scarcity of meteorological data from the Hudson strait region it has been thought of interest to give a short summary here.

The base camp of the expedition was situated at the mouth of a valley, trending westward, on the east coast of the island, and the barograph was in use at this position, some 20 feet above the sea level, while the Stevenson screen containing the other instru-

ments was situated 100 yards to the north and 75 feet above sea level. The autographic records of pressure, temperature and humidity for the period August 21st, 1931, to September 17th, 1931, have been tabulated, and the results of these tabulations may be summarised.

The average barometric pressure for the period was 1,011mb. As no opportunity had occurred of standardising the barograph against a mercurial barometer, an attempt was made to check the accuracy of the readings by comparison with values interpolated from the isobaric charts of the *Daily Weather Report*. While this procedure is satisfactory where the network of observing stations is fairly close, as in the British Isles, it must be regarded as somewhat rough and ready in the present instance and the result, that the barograph on an average of 21 readings was 3mb. high (probable error, ± 0.3mb.), can be taken as an indication that the instrument was in reasonably good adjustment.

The diurnal variation of pressure, with an amplitude of 0.5mb., is well marked considering the short period of observations. Pressure varied between 1,024mb. and 989mb., the average daily range (midnight to midnight) being 7mb. and the greatest daily range 23mb.

The thermograph readings were standardised by means of the three daily eye observations of temperature. The corrections to the thermogram readings are somewhat irregular owing, presumably, to slight errors in clock timing in conjunction with numerous small oscillations of temperature which form a conspicuous feature of the thermograms in the late evening and early morning. These oscillations at times give the curves the appearance associated with the passage of "fronts"; it may be presumed that they are ultimately an effect of the topography, but in the absence of autographic records of wind no attempt at a detailed explanation is made.

The mean temperature for the whole period was 44.5°F., and the amplitude of the diurnal variation about 4°. The highest hourly reading was 65° and the lowest 36°, whereas according to the maximum and minimum thermometers the extremes were 65° and 32°—the discrepancy in the minimum readings is due to the fact that the thermograph was out of action on the day of the occurrence of the actual lowest temperaure.

The mean relative humidity over the period was 83 per cent. with a small diurnal variation. The hygrograms show small oscillations, the inverse of those on the thermograms.

The prevailing winds were westerly, and on a few occasions easterly winds were experienced, but there were scarcely any winds from northerly or southerly directions. The direction of wind was evidently strongly controlled by the topography. Gale force was recorded at 6 per cent. of the observations. It is

difficult to say how closely these observations represent normal conditions in August and September at Akpatok.* There are no stations for which normal values are available nearer than Hebron (Labrador) and Port Churchill (on the western short of Hudson Bay). Of these Port Churchill has the more extreme climate, the summer there being 5° to 10° warmer and the winter about 15° colder than at Hebron, while the spring and autumn temperatures are about the same. The mean temperature recorded at Akpatok island agrees to within 1° with the interpolated value for the normal during the corresponding period at Hebron, and is about 2° lower than that for Port Churchill.

Some daily values for Port Burwell, about 70 miles to east-north-east of Akpatok island appear in the *Daily Weather Report*, and an attempt was made to compare these with the corresponding observations at the island.

The temperature at 20h. 75th meridian time was, on the average of nine observations in August, 11° warmer at Akpatok island than at Port Burwell, and on the average of nine observations in September, 4° warmer at Akpatok island. On two occasions only was the temperature at Port Burwell the higher. There is not sufficient information to explain these differences.

Of 21 occasions on which comparable observations are available, there were 10 on which the directions of wind at the two places were in agreement, six on which it may be surmised that a katabatic wind was blowing at the base in opposition to a weak gradient of pressure, three on which minor "frontal" phenomena were probably present, and two occasions on which discrepancies in wind direction appeared, for which no explanation can be proposed. None of the frontal phenomena present was well marked: on the occasion of the greatest barometric movement a depression was passing to the southward. The average temperature of the sea water was 37°, or 7.5° below the air temperature. A single observation of temperature of the soil was made, by digging into the ground and inserting a thermometer into the sides of the excavation.

At the time of observation the air temperature 3 ft. above the upper surface of the vegetation was 3° lower than that 2 in. above the surface. Half an inch below the upper surface of the vegetation the temperature was 1° higher than at 2 in. above it. The thickness of the covering of vegetation was 4 in. In the ground the temperature fell from 45° at 3 in. below the surface to 40° at 2 ft. 6 in. below the surface, at which depth solid rock was reached.

The following is a summary of the results in tabular form :—

*In the report a note is made of the fact that the weather conditions in the Ungava Bay region may be extremely localised.

AKPATOK ISLAND

Lat. 60°20′N., long. 67°56′W.

Period, August 19th, 1931, to September 18th, 1931

Pressure

Mean	1,011mb.	Mean absolute daily range	7mb.
Highest	1,024 ,,	Highest ,, ,, ,,	23 ,,
Lowest	989 ,,	Lowest ,, ,, ,,	2 ,,
		Amplitude of mean diurnal variation	0.5 ,,

Temperature

Mean	44.5°	Mean absolute daily range	9.2°
Highest	65°	Highest ,, ,, ,,	22.5°
Lowest	32°	Lowest ,, ,, ,,	3.7°
Mean temperature of sea water	37.2°	Amplitude of mean diurnal variation	3.9°

Relative humidity

Mean	83 per cent.	Mean absolute daily range	23 per cent.
Highest	100 ,, ,,	Highest ,, ,, ,,	36 ,, ,,
Lowest	53 ,, ,,	Lowest ,, ,, ,,	2 ,, ,,
		Amplitude of mean diurnal variation	10 ,, ,,

Wind

No. of occasions of

	Force 8 or above	Force 4 to 7	Force 1 to 3	Calm	N	NE	E	SE	S	SW	W	NW
*8h.	3	10	8	8	0	2	1	1	0	2	14	1
14h.	2	11	14	2	0	4	6	1	0	1	13	2
20h.	0	14	9	6	0	2	4	0	1	1	13	2

Correspondence

To the Editor, *The Meteorological Magazine.*

Well-defined Rain Area

I witnessed a rather remarkable phenomenon during the thunderstorm this afternoon (August 1st).

I was standing under the porch of the Metropolitan Railway Station in Queen's Road, Bayswater, at 2.30 p.m. The sky was suddenly overcast with dark clouds. The prevailing wind was from SW. Towards the north-east I saw small stringy clouds approaching (from the north-east) and seeming to rise in the sky—this is perhaps a normal prelude to a thunderstorm.

It began to rain—heavily at first and then softly. Suddenly torrential rain fell only one hundred yards from where I was standing. The nearest trees in Kensington Gardens were almost hidden behind a milky mist of heavy rain. The rain-drops

*Standard of time. Newfoundland Summer Time, 2h. 31m. slow on G.M.T.

rebounding off the street created a layer of spray as high as the tops of the wheels of the taxis standing in the street. Where I was sheltering, hardly a drop of rain was falling. The contrast was so striking that I called the attention of an unknown bystander (as though I could not believe my eyes). Then the spray on the ground came nearer like a wave, and receded. Suddenly it vanished completely, and the trees behind in Kensington Gardens stood out black against the sky. It was over. Afterwards the storm continued in a normal manner.

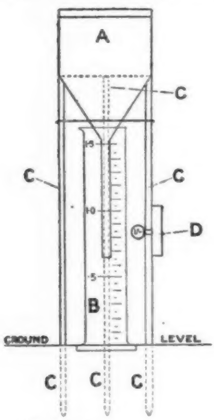
I have witnessed phenomena something like this in the Tropics; but never before have I seen in England really torrential rain a hundred yards away, with only a few drops falling where I was standing. It was extremely local, and, I suppose, was something in the nature of a waterspout.

G. A. HINKSON.

23, *Queensborough Terrace, London, W.2. August 1st*, 1932.

Intense Rain in Hertfordshire

Rain of noteworthy intensity accompanied the eastward passage of a short but severe thunderstorm over the district of Hertfordshire between Rickmansworth and Chorley Wood early in the afternoon of July 27th. For the $5\frac{1}{2}$ minutes from 13h. 25m. to 13h. $30\frac{1}{2}$m. (G.M.T.) the measurement here was 0.42in. At 13h. 27m. the downpour became extremely heavy for about one minute. Eye observations made from shelter with a gauge of special construction and a stop watch showed that 0.10in. fell in 49 seconds. Of this, the first 0.05in. occupied 24 seconds and the second 0.05in. 25 seconds. The rates of fall per hour were thus 7.35in. for the whole interval of 49 seconds, 7.50in. and 7.20in. for the first 24 seconds and last 25 seconds, respectively.



A. FUNNEL.
B. GRADUATED GLASS RECEIVER.
C.C.C. WOODEN SUPPORTS.
D. LAMP & BATTERY.

During the storm the wind veered from WSW. to W., with a squall of force 6, while temperature in the screen dropped suddenly from 62.0°F. to 56.4°F. There was no hail. When rain finally ceased at 13h. 32m. the road along the valley was flooded several inches deep at its lowest point. Bright sunshine followed at 13h. 35m., and set the whole countryside " steaming " for a few minutes.

The simple contrivance from which the above short-period

measurements were obtained was suggested by a diagram of an early model of Symons's " Storm " rain-gauge, devised by the founder of the British Rainfall Organization for use at Camden Square some 60 years ago. A standard 8-in. funnel is mounted on a skeleton wooden frame over a glass receptacle so clearly graduated that the level of the contained water can be read from shelter at any moment with the aid of a binocular. The attachment of a small electric bulb and battery to the framework of the instrument enables observations to be made at night. There is usually very close agreement between the readings thus obtained and those from the ordinary 5-in. gauge situated 30 yards distant. In the storm of July 27th the two totals were identical.

E. L. Hawke.

Caenwood, Rickmansworth, Herts. July 29th, 1932.

Heavy Rain in Manchester

Mr. W. F. H. Creber, Engineer to the Manchester Corporation Waterworks, forwards some details of the thunderstorm which occurred during the evening of July 11th to the east of Manchester. At Arnfield Reservoir and Godley Reservoir the amounts for the rainfall day were 3.05in. and 3.64in. respectively. At Stalybridge (Swineshaw Lodge) and Stalybridge (Brushes Reservoir), where records are maintained by Mr. M. T. B. Whitson, the amounts were 3.65in. and 4.02in. respectively. The bulk of the rainfall occurred within 4 hours from 16h. to 20h. Mr. Creber compares the storm with that of June 18th, 1930, when 3.59in. was measured at Rhodes Wood Reservoir and 4.10in. at Glossop Waterworks (Swineshaw) nearer the Peak. So far as the catchment area of the Manchester Corporation in the Longdendale Valley is concerned Mr. Creber concludes that " in amount and intensity the fall on July 11th, 1932, is a record, taking into account the area over which 3in. or more fell." The damage to watercourses, &c., was certainly greater then than on June 18th, 1930.

Water Spouts at the Lizard

Mr. J. E. Clark, of Street, Somerset, has sent the following extract from *The Friend* of July 22nd, 1932 :—

Water Spouts at the Lizard. . . . At ten o'clock last Wednesday morning (July 13), an interesting squall cloud appeared off here. During its passage the wind changed from north-east to south, and a heavy shower fell. From the edge of this cloud out at sea, a whole series of " funnel clouds " formed. Even though the actual clouds never quite reached the sea, the vortex evidently did, as the sea below each funnel was very much dis-

turbed and appeared as if boiling, and a cloud of "steam" above it was circling rapidly.

The hollow core of the funnel cloud was clearly visible as a white band down the centre of the funnel, and the whole cloud was in a state of rapid turbulent motion.

These clouds kept forming and disappearing for about a quarter of an hour, and at one time as many as seven were visible at the same time. The rapidity with which the spouts formed and vanished again was at times extraordinary: it was just as if some mysterious tongue was being flicked out of the cloud and back . . . . . A. C. PHILLIPS, Tresawle, The Lizard, Cornwall.

Tornadoes at South Farnborough, Hants

During the latter part of the morning of May 30th, 1932, a wide belt of black, ominous looking cloud had been steadily forming and at 12h. 35m. B.S.T. stretched almost from the south-south-west to the north-north-east horizon, the centre of the belt being somewhat to the east of the zenith. At this time our attention was called to a funnel-shaped protuberance hanging vertically downwards from a much disturbed under-surface part of the black cloud at a distance of about two miles to the south-south-east, and we soon realised we were watching a small tornado, grey in colour against the dark background. The height of the black cloud base was 3,000 to 4,000 feet and the lower end of the tornado appeared to be eclipsed by lighter scud at about 2,000 feet above the ground. Approximate calculations showed that the length of the funnel was of the order of 250 feet and the width of the thickest part about thirty feet. After a minute or so the end swung first to the left and then to the right and finally became vertical. The sides, which had previously been clear cut, now became diffuse, and wispy cloud appeared to be ascending there in spirals about vertical axes. Soon after this, at about 12h. 40m. the tornado appeared gradually to withdraw into the cloud base after being under observation for about five minutes. Meanwhile another had formed about 2,000 feet to the left of the first but did not attain to the same length; it was wider and truncated. Between 12h. 40m. and 12h. 50m. two further truncated tornadoes formed suddenly near the second position, but both gradually withdrew into the cloud. All four tornadoes appeared to be stationary and to form along a line about midway between the further edge and the south-south-west to north-north-east axis of the black cloud belt, but there is some divergence of opinion as to whether the line of formation was parallel to this axis or inclined at an angle to it. The phenomenon ceased at 12h. 50m. At 12h. 55m. large drops of rain began to fall followed at

13h. 5m. by heavy rain in the nature of a cloudburst, 5mm. being recorded in nine minutes and 10mm. in twenty-one minutes. The rain moderated at 13h. 45m. but did not cease until 14h. 35m., giving a total fall of 14.1mm. The ensuing clearance indicated that the rain belt either remained practically stationary and dissipated its energy or moved very slowly northward. The heavy rain caused a small amount of flooding.

The synoptic charts for May 30th showed a series of very shallow low pressure areas over southern England between depressions to the west and east and anticyclones to the north and south. Although the belt of black cloud gave the impression of a stationary line squall cloud there was no obvious front indicated on the surface over southern England. The evidence available points either to a convergence of wind currents or to the formation of an unstable condition of a warm easterly underneath a colder westerly current. Midday balloon ascents from stations to the east gave light southerly surface winds backing to SE. or E. above 2,000 feet, while those to the west and south-west showed light WSW. or W. winds at all heights up to 4,000 feet. At the time of the tornadoes the wind at the surface was calm apart from gusts of 5 m.p.h. at 12h. 38m. and 12h. 45m., and near objects were unusually clear. Nephoscope observations on the cloud level at the top of the tornado (about 4,000 feet) gave a wind of 12 m.p.h. from WSW.: on the scud at about 2,000 feet, 5 m.p.h. from E. Subsequently the winds became light, westerly at all heights up to 4,000 feet with a layer of very light north-easterlies from 5,000 to 8,000 feet. There were no pressure changes indicated whilst these tornadoes were in evidence, but a slow rise of 0.5mb. occurred between 13h. and 14h. Temperature fell gradually 2°F. from 12h. 30m. to 12h. 45m., was steady to 13h. 5m. followed by a 2.5°F. fall at 13h. 5m. The corresponding humidity trace showed a rise of 7 per cent. at 12h. 35m., a gradual rise of 1 per cent. to 13h. followed by a sharp rise of 13 per cent. to 13h. 35m. The only available upper air temperature record at this station was a single reading at 2,000 feet at 10h. 30m., *i.e.*, before the belt of cloud began to form. This showed a lapse rate of 4°F. per 1,000 feet between the ground and 2,000 feet. The midday ascent at Duxford gave a similar lapse rate up to 2,000 feet and above 3,000 feet, but in the layer between these figures a much steeper rate of 7°F. per 1,000 feet. The temperature at 2,000 feet had risen 8°F. since the morning ascent, but that at 3,000 feet—the cloud base—only 2°F.

W. H. Bigg.
J. S. Smith.

Royal Aircraft Establishment, S. Farnborough, Hants. June 15th, 1932.

Brighter Meteorology

It is difficult to think of Meteorology as a subject for levity and the *Meteorological Magazine* cannot be accused of ever departing from its dull, but instructive tenor. The following weather diary written by an Asiatic subordinate officer, temporarily loaned to the Meteorological Service, may be of interest.

" May 14th, 1932. The day unveiled a bright sky with the sun in the lifeless East amidst the white clouds like speckled beads in a bride's veil and existed till afternoon."

When asked where he got this from he replied that when in doubt about the weather he always read up Edgar Wallace's descriptions.

V. A. Lowinger.

Malayan Meteorological Service, Kuala Lumpur, Malaya. July 1st, 1932.

NOTES AND QUERIES

Atmospheric Effects resulting from the Andine Eruptions

In an article in the *Meteorological Magazine* for May, it was pointed out that the spread of volcanic dust from the Andes might be expected to cause optical phenomena in the southern hemisphere, but not in the northern. This expectation has been justified, for sunset glows have appeared in both South Africa and Australia. The eruptions began on April 10th; letters from Johannesburg published in *Nature* for June 25th and July 23rd describe sunset glows which began before May 3rd and were still continuing, even becoming finer, on May 18th. The letters describe a strong red glow extending over nearly the whole sky on most nights, even when no clouds are present. The red light was so powerful that everything caught a reflected tint; it was best about an hour after sunset, when normally it is quite dark.

A letter from Mr. R. C. Barnes in *The Times* for June 30th also describes flaming pink sunset glows in the Orange Free State in April and May. A letter from Mr. M. P. Cogan, Perth, Western Australia, dated May 30th and published in *The Times* for June 28th describes beautiful after-sunset and before-sunrise glows during the preceding month over the whole of Western Australia and also in eastern Australia and New Zealand. Hitherto no reports of optical phenomena due to volcanic dust have been received from the northern hemisphere.

A letter from Dr. E. Kidson, referred to in *Nature* for July 23rd, describes the sunsets in New Zealand as commencing about the end of the first week in May, and ranging from pale pink to yellowish pink. Dr. Kidson also states that the measurements of solar radiation at noon, made with an Ångström pyrheliometer, showed a sudden decrease of about 10 per cent. on May 5th, followed by a slight recovery. The

distance from the Andes eastward to New Zealand is about 13,000 miles, and it appears that the main mass of volcanic dust travelled eastwards at 20-30 miles per hour; an unexpectedly low velocity compared with that reached by the Krakatoa dust.

A striking phenomenon of the Krakatoa eruption was the series of atmospheric waves which travelled several times round the world, and which was recorded on barographs in all countries. The general nature of the waves was a slight rise and a sudden fall of about 1mb., followed by a period of disturbance lasting one to two hours. Since the Krakatoa eruption the sensitive micro-barograph has been invented, and the micro-barograph records from stations in the British Isles, Egypt and Iraq have been searched for traces of similar disturbances. A wave originating in the Andes on the morning of April 10th should have reached England on the afternoon of the same day, but although most of the records show a series of minor fluctuations, there is no one feature which is common to all of them, while the record from Lerwick is practically a straight line with no disturbance of any kind. Hence it can be said that we have no instrumental record of the passage of air waves from the Andine eruptions across the British Isles or the eastern Mediterranean.

This result is not unexpected. The Krakatoa air waves were due to a single explosion of extreme violence which almost demolished the island, but the South American phenomena included an intermittent series of far less intense explosions in a number of different volcanoes.

The Shyok Dam

The Times for July 13th contained the news that an ice dam on the upper part of the Shyok River, a tributary of the Indus, burst at 3 a.m. on July 12th, and that the Indus was rising rapidly. The peculiar configuration of this area was described in the *Meteorological Magazine* for September, 1929; briefly, four glaciers protrude from the westward into the upper Shyok, and from time to time extend completely across the narrow valley. Behind the barrier formed in this way a lake is formed, until the pressure of the water breaks through the dam and the accumulated mass pours down the valley. This happened in August, 1929, when the Indus, already high, reached a level of more than 50 feet above normal and caused serious damage by flooding.

On the present occasion the Shyok River rose rapidly 50 feet but subsided again as rapidly. The Indus was low, and although it rose to 30 feet above normal, the water was quickly carried away and no serious damage was done. The cause of the sudden fall is believed to be that after the Shyok had broken

through the dam, the rush of water swept great blocks of ice into the gap and quickly closed it again.

The Malayan Meteorological Service

In 1928 the Malayan Meteorological Service, which is a branch of the Survey Department of the Federated Malay States and Straits Settlements, was greatly expanded, and Mr. C. D. Stewart was appointed Superintendent. In the following years a number of new stations were established, completely equipped with autographic instruments and staffed by full-time observers, while the previously existing stations were inspected and their observations placed on a uniform basis. The results of these activities appear in the "Summary of observations, 1931," recently published as a volume of 195 folio pages, mainly tables.

A descriptive introduction gives a good general account of the normal climate of Malaya and the departures from normal during 1931. Then follow tables for 18 meteorological branch stations, including three at levels above 4,000 feet. These summaries are remarkably complete, each station occupying eight pages. They include the monthly averages and extremes of maximum and minimum temperature, rainfall, sunshine and days with various phenomena, full observations at three fixed hours daily, frequency tables, hourly means for each month of temperature, humidity, sunshine and rainfall, and analyses of the pressure-tube anemograms. Finally there are shorter summaries of temperature, humidity and rainfall for 49 auxiliary stations, mostly observing three times daily. A large folding reference map shows the positions of all these stations. The volume is excellently produced, and the apparent freedom from errors reflects credit on both printer and proof-reader.

Alpine Climatology

Dr. V. Conrad, Professor of Meteorology at the University of Vienna, has recently published the results of several researches into the climate of the Alps. Of special interest is a study of the duration of the snow-cover,* in which the duration at different heights is approximately defined by the equation:

$$\text{Duration (days)} = 23 + 0{\cdot}1\ h,$$

where h is the height above sea-level in metres. Inner valleys parallel with the mountain ranges have shorter durations, and the weather side of the mountains longer durations than those given by the formula. The decisive factor is the total snowfall; other elements are of less importance.

*Beitrag zur Kenntnis der Schneedeckenverhältnisse in den österreichischen Alpenländern, by C. Conrad and M. Winkler. *Gerlands Beitr. Geophys., Leipzig*, 34, 1931, pp. 473-511.

Conrad and Biel* describe the duration of temperatures within definite limits, a study of special botanical interest. The durations in days of temperatures above 5°C. (41°F.) are expressed by the formulæ :

Switzerland $D = 268 - 0{\cdot}0698\ h$.

Lower Austria $D = 240 - 0{\cdot}0556\ h$.

A third paper† deals with the climate of the Austrian mountain health resort of Semmering and the neighbouring district. The distribution of the various elements (rain and snowfall, cloudiness and sunshine) according to elevation is discussed statistically and detailed tables are given for a number of stations. A favourable feature is the abundant winter sunshine.

Reviews

British Rainfall, 1931. Size, 9 × 6. Pp. xxi + 306. 2 Plates. *Illus.* Price 15s. net.

The seventy-first annual volume of *British Rainfall* includes the records from 5,329 stations. The number of stations in England, Wales and Ireland is practically identical with that in the previous volume, while in Scotland there is a net gain of 16 stations. The county with the largest gain is Ayrshire, and this is due mainly to the enthusiasm of Mr. W. Dunbar, F.R.Met.Soc., who collects the rainfall data monthly and sends a summary, including a map showing the distribution of the rainfall, soon after the close of each month to all contributing observers.

The volume, which is on the same lines as its predecessors, is a comprehensive summary of the rainfall of 1931, both as regards its incidence during the year and its variations from place to place. There are, in addition, a number of special articles dealing with problems relating to the exposure of rain-gauges and discussing some of the long series of records which have been accumulated.

The section dealing with "Heavy falls on rainfall days in 1931" contains an account of the rainfall of November 2nd and 3rd, when 9.61 inches was recorded at Blaenau-hydfer between Trecastle and the Black Mountains, and of the cloudbursts near Bootle (Cumberland) on June 14th, 1931.

The general table, showing the annual rainfall at the 5,329 reporting stations, includes a column for the average annual amounts. This column is more complete each year, as additional averages are computed, and in the present volume averages are given for more than half the stations.

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*Isanomalen der Andauer einer bestimmt vorgegebenen Temperatur. *Stockholm, Geogr. Ann.*, 1929, pp. 209-312.

†Zum Klima des Semmeringgebietes. *Wien Beih. Jahrb. Zentralanst. Meteor. Geodyn.*, 1928.

The special articles include a discussion by Mr. E. G. Bilham of the measurements of evaporation at Valentia Observatory, Co. Kerry, which shows that the anomalous results obtained from the tank in wet, windy weather may be accounted for by losses due to outsplashing. A subsequent article gives estimates of the general monthly rainfall over England and Wales from 1727 to 1931.

It is satisfactory to find that the volume was published on August 16th, a date earlier than that of any other year since before the war.

An Elementary Geography of the Gold Coast. By D. T. Adams, B.A. (Oxon).

Although this book has been written primarily to provide the scholars of the Gold Coast with a geography of their own country, it will undoubtedly be of much value also to anyone requiring information about this fascinating colony of our Empire, for it is full of interesting facts about the country, its people and its trade.

Writing this review as I steam along the African coast, I cannot help recalling to mind the former reputation of this part of the Empire as being the " white man's grave." After reading Mr. Adams' account of the development of the country in recent years, even those hitherto unacquainted with the colony will realise that the various civilising factors, one of the principal of which has been education, have brought about vast changes in the Gold Coast and that this colony is now one of the most progressive in the Empire. An indication of the scale on which the country has been developing may be gathered from the amazing growth of the cacao farming industry alone. The value of cacao exports has increased from £755,347 in 1909 to £11,229,512 in 1928.

The book is fully illustrated and is written in an easy style which should appeal to students, the principles of geography being introduced through examples with which they are thoroughly familiar in their everyday life. At the end of each chapter is a summary of its contents and a set of questions and practical exercises, which should be of considerable value in bringing home to the students the close connexion betwen the subject and the life around them. The chapter on the weather is particularly interesting and forms a useful introduction to climatology for schools.

This is an admirable little book that can be highly recommended.

L. G. Garbett.

Memorie del R. Ufficio Centrale di Meteorologia e Geofisica. Ser. 3, vol. 3. Rome, 1931.

The third volume of the fine series of memoirs published by

the Italian Meteorological Service in recent years contains five papers. The first, and by far the longest (164 pages), by G. Agamennone and A. Cavasino, consists of a study in great detail of the earthquake of the western Riviera on February 23rd, 1887. A valuable paper by P. Gamba discusses the occurrence of fog at Pavia, the frequency of various types of fog being shown in a number of tables, while special examples receive detailed examination on the basis of meteorological observations at intervals of a minute or so. The vertical distribution of temperature and humidity up to 1,500 metres during fog is illustrated by a number of diagrams. The same author gives the results of a number of pilot-balloon ascents at the Royal Geophysical Observatory of Pavia in a detailed paper on the lower currents of the atmosphere, changes of velocity and direction being presented month by month up to 6,000 metres.

D. Pacini discusses the results of a large number of observations of condensation nuclei and atmospheric dust, emphasis being laid on the importance of Aitken nuclei near the ground. The average number of the latter at Bari was found to be 33,400 per cubic centimetre. The transparency of the atmosphere depends principally on the number of these nuclei and the relative humidity, nuclei of marine origin being especially apt to cause obscurity. It was found that water vapour does not condense on dry dust. The final memoir by A. Puppo gives a statistical summary of rainfall at Conegliano near Venice.

India Meteorological Department, Scientific Notes. Vol. III, No. 22. *The Structure and movement of a storm in the Bay of Bengal during the period 13th to 19th November,* 1928. By K. R. Ramanathan, M.A., D.Sc.; and Vol. III, No. 24: *On the utility of observations of barometric characteristics and tendencies for local forecasting in north-west India.* By R. P. Batty, B.A.

A depression with a warm sector moved north-westward into the Bay of Bengal. The first paper describes the life history of the system and the movements of the fronts, and the associated upper wind observations over India, which show the discontinuity.

In the second paper, the barometric tendencies at Quetta for the interval 4 a.m. to 7 a.m. (local time) are studied for the period July, 1928, to June, 1930. Owing to the large diurnal variation, the pressure is almost always higher at 7 a.m. than at 4 a.m., but the investigation shows that nevertheless the tendencies are of some value for forecasting. In particular, if the barometer is rising unsteadily the weather is likely to be unsettled during the day. (See also *Meteorological Magazine* 66, 1931, p. 231.)

C. K. M. Douglas.

India Meteorological Department, Scientific Notes, Vol. 1, No. 10.—Distribution of temperature in the lower stratosphere. By P. R. Krishna Rao, B.Sc.

The term "isothermal region" was used by the earlier investigators for what is now called the stratosphere, but had to be discarded when the progress of observations showed that in many cases the lower stratosphere was a region of increasing temperature. Some years ago it was shown* that over the British Isles the average distribution of temperature in the stratosphere begins with an inversion of 3°C. at the bottom; the present study analyses on similar lines data from 9 stations in other parts of the world between lat. 6°S. and 68°N., but mostly between 40° and 50°N. It is shown that the inversion layer at the base of the stratosphere is much deeper in tropical than in temperate regions; also lower values of the temperature at the base of the stratosphere are associated with deeper and more pronounced inversions. A qualitative explanation on lines given by Dr. C. Braak is added, the various phenomena being attributed to the more intense convection in tropical regions.

S. T. A. Mirrlees.

Books Received

Hourly Sunshine at Wellington, January to June, 1929. By D. C. Meldrum. New Zealand, J.Sci.Tech., Vol. xi, No. 6, pp. 382-4, Wellington, 1930; and *Hourly Sunshine at Wellington, July to December*, 1929. By D. C. Meldrum. New Zealand, J.Sci.Tech., Vol. xii, No. 3, pp. 142-4, Wellington, 1930.

Nautisk-Meteorologisk Aarbog, 1931. The Danish Meteorological Institute, Copenhagen, 1932.

Obituary

We regret to learn of the death on August 6th, 1932, of Dr. J. E. Crombie of Parkhill House, Dyce, Aberdeenshire.

News in Brief

We learn from *Nature* that Dr. H. R. Mill has been appointed by the King of Norway a Commander (2nd class) of the Order of St. Olav for his services to Norwegian arctic explorers.

The Rev. J. P. Rowland, S.J., has been appointed director of the Stonyhurst College Observatory in succession to the Rev. E. D. O'Connor, S.J., who has been appointed rector of the College.

*An analysis of the changes of temperature with height in the stratosphere over the British Isles, by L. H. G. Dines. *London, Mem. R. Meteor. Soc.*, Vol. 2, 1928, No. 18.

On July 23rd Mr. E. J. Hood retired from the Meteorological Office after a period of service only three months short of fifty years. Mr. Hood was born on July 24th, 1867, and entered the Office in 1882. For the first 38 years his work lay in the "Accounts" section, but in 1920 he was engaged on statistical work. For the last few years he has assisted in the compilation of *British Rainfall*, where his experience and accuracy proved very valuable. On his last day of duty Mr. Hood was the recipient of a presentation from the staff, in the form of a portable wireless set.

Erratum

JULY, 1932, title under the diagram facing p. 134; *delete* the word "Torquay."

The Weather of July, 1932

Pressure was above normal over Mexico, central North Atlantic, Greenland, Jan Mayen, Spitsbergen, northern Scandinavia, northern Russia and the central Iberian Peninsula, the greatest excess being 3.4mb. at 50°N.30°W. Elsewhere in North America and Europe pressure was below normal, the greatest deficits being 6.4mb. at 50°N.70°W., 4.6mb. at Corunna and 4.4mb. at Astrakhan. Temperature was above normal over the British Isles, Sweden (as much as 3½°F. in Svealand and Gothaland) and Spitsbergen and below normal in northern Norway, Switzerland and Portugal. Rainfall was generally in excess but deficient in Spitsbergen and parts of Sweden: in the north-east of Svealand it was only half the normal.

The weather over the British Isles during July was mainly unsettled. Thunderstorms were frequent in many parts, and consequently the total rainfall for the month was distinctly variable, only a few small areas having less than the normal amount of rain, while Cranwell (Lincolnshire) had more than four times the average fall. The mean temperature for the month was above normal generally, but sunshine was markedly deficient. During the first part of the month pressure was low near Iceland, giving unsettled weather in the north and west but mainly fine sunny conditions in the south and east. Except for a few local heavy falls the rainfall was slight during this period and the sunshine records good. Totals of from 13-15hrs. bright sunshine were sometimes recorded along the south coast between the 1st and 8th. Brighton had 14.8hrs. on the 8th. Thunderstorms occurred locally on the 3rd, 4th and 5th. Temperature was also mainly above normal, but the finest and warmest weather of the month occurred between the 9th and 11th, when a belt of high pressure extended from the Azores to the Baltic; 88°F. was recorded at Greenwich and 85°F. at

Nottingham, Huddersfield and Cranwell on the 10th. Night temperatures were also high during this time, being frequently above 60°F.; 67°F. was the screen minimum at Cambridge and Tottenham on the 10th. Widespread thunderstorms developed on the 11th, the thundery conditions persisting for the next few days; at Cranwell 5.11in. of rain were measured during a storm on the 11th, and a further fall of 2.40in. on the 13th, at Saltersford (Lincoln) 2.69in. on the 11th and 3.29in. on the 13th and at Llandysilio (Montgomery) 3.39in. on the 11th, and 2.93in. on the 12th. There ensued a period of cooler weather with shallow depressions covering most of the country; rain fell at times, but sunny periods were enjoyed in the north and west; Tiree had as much as 15.4hrs. sunshine on the 12th and 15.1hrs. on the 14th; Rothesay 15.2hrs. on the 17th. From the 18th to 23rd north-westerly winds prevailed and conditions were cool and changeable with much local thunder over the whole of Great Britain. Night temperatures were low on the 23rd and ground frost was experienced in parts of Scotland on that night, the ground minimum temperature at Dalwhinnie being 27°F. From the 23rd to the end of the month pressure was low over the British Isles and the weather unsettled, showery with bright intervals. Thunderstorms occurred at many places between the 24th and 27th, and the rainfall was heavy on the 24th and 25th, 3.42in. occurred at Devizes (Wiltshire) on the 24th, 2.19in. at Elham (Kent) on the 25th, and 2.16in. at Marlborough on the 24th. Much sun was recorded in the Midlands on the 25th with 14.8hrs. at Harrogate, and in southern Scotland and western England on the 26th with 12hrs. at Dunbar and 11.7hrs. at Falmouth. On the 29th the winds backed to SW. and temperature rose to over 70°F. both then and on the 30th. The 31st was a day of sunny periods interspersed with very heavy showers. The distribution of bright sunshine for the month was as follows:—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway	147	+ 2	Liverpool	130	—63
Aberdeen	125	—34	Ross-on-Wye	135	—64
Dublin	137	—33	Falmouth	157	—68
Birr Castle	113	—31	Gorleston	148	—83
Valentia	71	—88	Kew	140	—61

The special message from Brazil states that the rainfall distribution was irregular generaly, with 0.47in. above normal in the northern, central and southern regions respectively. The crops were mainly in good condition. Four anticyclones passed across the country in the first two decades of the month. At Rio de Janeiro pressure was 0.2mb. above normal and temperature 2.5°F. above normal.

Miscellaneous notes on weather abroad culled from various sources. Widespread thunderstorms occurred over central Europe and Spain during the early part of the month, and much damage was done to the market gardens at Calahorra, Logroño, Spain, where two men were killed. A destructive hailstorm, lasting 20 minutes, followed by heavy rain was experienced in the district of Füssen, Upper Bavaria, on the night of the 6th; the hailstones were said to be nearly 2½in. in diameter. Heavy storms also swept across the Allgäu the same day. Serious floods were reported from various parts of Bavaria and some landslips occurred about the 12th. Much damage was caused by storms in Switzerland about the 12th, and as a result of a cloudburst on the 17th between Florence and Leghorn long stretches of railway line were washed away while heavy rain also caused damage near Brescia. Heavy rain occurred around the central tableland of Spain about the middle of the month and bitter winds and rain over Castile. (*The Times*, July 5th-20th.)

Torrential rains at the close of the rainy season have caused widespread flooding in western and southern Japan, with some loss of life and much destruction of embankments and bridges. The rain ceased on the 2nd and the floods were subsiding by the 3rd. The monsoon was active over India generally, and owing to unusually heavy monsoon rain, which made large breaches in the railways, communication between Rangoon and Upper Burma was interrupted. Canton was flooded on the 30th after very heavy rains; the deaths are estimated at 200. (*The Times*, July 4th-August 1st.)

During the middle of the month there were constant dry and fairly dense mists followed by violent sandstorms in southern Algeria. (*The Times*, July 18th.)

Weather conditions in Canada were generally favourable for the crops, though lack of rain caused a setback in some areas towards the end of the month. A tornado demolished the principal buildings of Washington (Kansas) on the 4th. Temperature was about normal early in the month in the United States, but rose generally above normal after the middle of the month, while the rainfall was mainly in excess at first but deficient later. A heat wave passed across the country about the 20th and 21st, when temperatures of 100°F. and over were recorded locally; 38 deaths were reported. Mild wet weather caused some damage to the crops in the Argentine. (*The Times*, July 14th-30th, and *Washington, D.C., U.S. Dept. Agric., Weekly Weather and Crop Bulletin.*)

Rainfall, July, 1932—General Distribution

England and Wales	144	per cent of the average 1881-1915.
Scotland	121	
Ireland	138	
British Isles	137	

Rainfall: July, 1932: England and Wales.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Lond .	Camden Square	1·93	81	*Leics* .	Belvoir Castle...........	6·59	271
Sur .	Reigate, Alvington ...	2·43	108	*Rut* .	Ridlington	4·32	172
Kent .	Tenterden, Ashenden...	3·31	158	*Lincs* .	Boston, Skirbeck	5·68	258
,, .	Folkestone, Boro. San .	4·24	...	,,	Cranwell Aerodrome ...	9·89	424
,, .	Margate, Cliftonville...	2·50	126	,, .	Skegness, Marine Gdns	·97	45
,, .	Sevenoaks, Speldhurst	2·55	...	,, .	Louth, Westgate	2·81	112
Sus .	Patching Farm	3·42	142	,, .	Brigg, Wrawby St. ...	1·96	...
,, .	Brighton, Old Steyne..	2·70	124	*Notts* .	Worksop, Hodsock ...	3·16	139
,, .	Heathfield, Barklye ...	4·63	185	*Derby* .	Derby, L. M. & S. Rly.	3·77	159
Hants.	Ventnor, Roy. Nat. Hos.	3·01	149	,, .	Buxton, Devon Hos. ...	3·58	91
,, .	Fordingbridge, Oaklnds	3·59	179	*Ches* .	Runcorn, Weston Pt...	4·90	178
,, .	Ovington Rectory	3·74	145	,, .	Nantwich, Dorfold Hall	4·14	...
,, .	Sherborne St. John ...	2·54	114	*Lancs*.	Manchester, Whit Pk.	3·78	115
Berks .	Wellington College ...	2·40	116	,, .	Stonyhurst College ...	4·89	126
,, .	Newbury, Greenham...	1·87	84	,, .	Southport, Hesketh Pk	4·42	155
Herts .	Welwyn Garden City...	2·19	...	,, .	Lancaster, Strathspey	5·41	...
Bucks .	H. Wycombe, Flackwell	1·45	...	*Yorks*.	Wath-upon-Dearne ...	2·63	105
Oxf .	Oxford, Mag. College...	2·86	126	,, .	Bradford, Lister Pk. ...	4·77	173
Nor .	Pitsford, Sedgebrook...	4·34	184	,, .	Oughtershaw Hall	6·68	...
,, .	Oundle....................	3·63	...	,, .	Wetherby, Ribston H.	5·73	229
Beds .	Woburn, Crawley Mill	3·80	170	,, .	Hull, Pearson Park ...	1·93	83
Cam .	Cambridge, Bot. Gdns.	2·43	112	,, .	Holme-on-Spalding ...	2·72	...
Essex .	Chelmsford, County Lab	2·16	101	,, .	West Witton, Ivy Ho.	4·35	165
,, .	Lexden Hill House ...	2·21	...	,, .	Felixkirk, Mt. St. John	6·12	224
Suff .	Haughley House.........	1·92	...	,, .	Pickering, Hungate ...	4·92	183
,, .	Campsea Ashe...........	2·95	128	,, .	Scarborough	1·64	67
Norf .	Norwich, Eaton.........	...	...	,, .	Middlesbrough	3·54	138
,, .	Wells, Holkham Hall	2·85	123	,, .	Balderdale, Hury Res.	3·46	...
,, .	Swaffham, The Villa...	2·35	89	*Durh* .	Ushaw College	4·14	148
Wilts.	Devizes, Highclere......	5·93	255	*Nor* .	Newcastle, Town Moor	3·16	119
,, .	Bishops Cannings	5·77	231	,, .	Bellingham, Highgreen	3·17	96
Dor .	Evershot, Melbury Ho.	2·35	93	,, .	Lilburn Tower Gdns...	2·83	114
,, .	Creech Grange	3·37	137	*Cumb* .	Geltsdale.................	4·56	...
,, .	Shaftesbury, Abbey Ho.	3·82	149	,, .	Carlisle, Scaleby Hall	6·79	207
Devon.	Plymouth, The Hoe...	2·51	91	,, .	Borrowdale, Seathwaite	10·50	133
,, .	Launceston, Werringt'n	3·25	...	,, .	Borrowdale, Moraine...	...	...
,, .	Holne, Church Pk. Cott.	4·18	119	,, .	Keswick, High Hill...	7·33	...
,, .	Cullompton...............	2·83	105	*West* .	Appleby, Castle Bank	4·99	158
,, .	Sidmouth, Sidmount...	2·55	101	*Glam* .	Cardiff, Ely P. Stn. ...	4·10	132
,, .	Filleigh, Castle Hill ...	4·44	...	,, .	Treherbert, Tynywaun	8·00	...
,, .	Barnstaple, N. Dev. Ath	3·30	122	*Carm* .	Carmarthen Friary ...	5·81	165
,, .	Dartm'r, Cranmere Pool	7·50	...	*Pemb* .	Haverfordwest, School	3·80	119
Corn .	Redruth, Trewirgie ...	3·70	121	*Card* .	Aberystwyth	4·64	...
,, .	Penzance, Morrab Gdn.	3·15	116	,, .	Cardigan, County Sch.	3·52	...
,, .	St. Austell, Trevarna...	4·68	140	*Brec* .	Crickhowell, Talymaes	3·80	...
Soms .	Chewton Mendip	4·64	133	*Rad* .	Birm W. W. Tyrmynydd	5·25	128
,, .	Long Ashton	2·72	96	*Mont* .	Lake Vyrnwy............	7·10	207
,, .	Street, Millfield.........	2·71	108	*Denb* .	Llangynhafal	6·00	257
Glos .	Blockley	1·93	...	*Mer* .	Dolgelly, Bryntirion...	6·59	155
,, .	Cirencester, Gwynfa ...	2·31	89	*Carn* .	Llandudno	3·77	158
Here .	Ross, Birchlea............	2·28	100	,, .	Snowdon, L. Llydaw 9	18·65	...
,, .	Ledbury, Underdown..	2·26	100	*Ang* .	Holyhead, Salt Island	3·60	138
Salop .	Church Stretton.........	4·53	185	,, .	Lligwy.....................	4·06	...
,, .	Shifnal, Hatton Grange	3·98	177	*Isle of Man*			
Worc .	Ombersley, Holt Lock	...	...		Douglas, Boro' Cem. ...	3·21	105
War .	Birminghm, Edgbaston	2·53	109	*Guernsey*			
Leics .	Thornton Reservoir ...	2·94	118		St. PeterP't. Grange Rd.	2·57	127

Rainfall: July, 1932: Scotland and Ireland.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Wigt.	Pt. William, Monreith	2·72	97	*Suth.*	Melvich	3·49	...
,,	New Luce School	4·01	118	,,	Loch More, Achfary	6·71	65
Kirk.	Carsphairn, Shiel	5·89	112	*Caith.*	Wick	3·00	114
Dumf.	Dumfries, Crichton, R. I	3·12	...	*Ork*	Pomona, Deerness	...	...
,,	Eskdalemuir Obs.	8·29	202	*Shet*	Lerwick	3·33	145
Roxb	Branxholm	3·70	123	*Cork*	Caheragh Rectory	3·89	...
Selk	Ettrick Manse	4·93	111	,,	Dunmanway Rectory	3·10	79
Peeb	West Linton	2·90	...	,,	Ballinacurra	2·85	102
Berw	Marchmont House	2·40	79	,,	Glanmire, Lota Lo.	3·62	125
E. Lot.	North Berwick Res.	2·17	84	*Kerry*	Valentia Obsy	4·72	125
Midl	Edinburgh, Roy. Obs.	1·90	67	,,	Gearahameen	6·20	...
Lan	Auchtyfardle	2·83	...	,,	Killarney Asylum	...	...
Ayr	Kilmarnock, Kay Pk.	4·44	...	,,	Darrynane Abbey	3·17	83
,,	Girvan, Pinmore	5·37	147	*Wat*	Waterford, Gortmore	3·22	101
Renf	Glasgow, Queen's Pk.	3·06	105	*Tip*	Nenagh, Cas. Lough	4·14	132
,,	Greenock, Prospect H.	3·09	79	,,	Roscrea, Timoney Park	5·12	...
Bute	Rothesay, Ardencraig.	4·48	113	,,	Cashel, Ballinamona	4·42	152
,,	Dougarie Lodge	3·54	...	*Lim*	Foynes, Coolnanes	3·54	115
Arg	Ardgour House	12·70	...	,,	Castleconnel Rec.	3·20	...
,,	Glen Etive	...	...	*Clare*	Inagh, Mount Callan	6·71	...
,,	Oban	4·41	114	,,	Broadford, Hurdlest'n.	3·45	...
,,	Poltalloch	4·67	114	*Wexf.*	Gorey, Courtown Ho.	3·96	135
,,	Inveraray Castle	7·86	158	*Kilk*	Kilkenny Castle	4·34	154
,,	Islay, Eallabus	4·43	130	*Wick.*	Rathnew, Clonmannon	5·28	...
,,	Mull, Benmore	14·80	...	*Carl*	Hacketstown Rectory	5·45	158
,,	Tiree	3·72	...	*Leix*	Blandsfort House	4·54	145
Kinr	Loch Leven Sluice	3·43	119	,,	Mountmellick	...	...
Perth	Loch Dhu	...	...	*Offaly.*	Birr Castle	3·69	125
,,	Balquhidder, Stronvar	5·48	...	*Kild'r.*	Monasterevin	...	...
,,	Crieff, Strathearn Hyd.	4·38	147	*Dublin*	Dublin, FitzWm. Sq.	4·27	167
,,	Blair Castle Gardens	4·38	171	,,	Balbriggan, Ardgillan.	4·19	155
Angus.	Kettins School	3·74	158	*Meath.*	Beauparc, St. Cloud	5·14	...
,,	Dundee, E. Necropolis	3·92	143	,,	Kells, Headfort	4·98	157
,,	Pearsie House	3·40	...	*W.M.*	Moate, Coolatore	3·68	...
,,	Montrose, Sunnyside	3·57	136	,,	Mullingar, Belvedere	4·02	126
Aber	Braemar, Bank	3·78	147	*Long*	Castle Forbes Gdns.	4·49	144
,,	Logie Coldstone Sch.	2·99	101	*Gal*	Ballynahinch Castle	6·04	145
,,	Aberdeen, King's Coll.	3·41	121	,,	Galway, Grammar Sch.	4·65	...
,,	Fyvie Castle	3·25	100	*Mayo*	Mallaranny	6·32	...
Moray	Gordon Castle	2·61	81	,,	Westport House	4·44	143
,,	Grantown-on-Spey	...	...	,,	Delphi Lodge	10·03	151
Nairn.	Nairn	...	...	*Sligo*	Markree Obsy	6·09	177
Inv's	Ben Alder Lodge	4·99	...	*Cavan.*	Belturbet, Cloverhill	...	...
,,	Kingussie, The Birches	3·52	...	*Ferm*	Enniskillen, Portora	...	...
,,	Loch Quoich, Loan	9·75	...	*Arm*	Armagh Obsy	5·25	182
,,	Glenquoich	10·74	167	*Down*	Fofanny Reservoir	7·09	...
,,	Inverness, Culduthel R.	2·87	...	,,	Seaforde	5·08	159
,,	Arisaig, Faire-na-Squir	6·05	...	,,	Donaghadee, C. Stn.	5·54	198
,,	Fort William, Glasdrum	7·99	...	,,	Banbridge, Milltown	4·54	...
,,	Skye, Dunvegan	4·45	...	*Antr*	Belfast, Cavehill Rd.	5·31	...
,,	Barra, Skallary	4·33	...	,,	Glenarm Castle	3·29	...
R & C.	Alness, Ardross Castle	2·86	94	,,	Ballymena, Harryville	4·18	122
,,	Ullapool	3·58	113	*Lon*	Londonderry, Creggan	4·92	134
,,	Achnashellach	6·67	...	*Tyr*	Omagh, Edenfel	5·44	160
,,	Stornoway	2·81	...	*Don*	Malin Head	5·14	...
Suth	Lairg	3·48	111	,,	Dunfanaghy	5·41	...
,,	Tongue	4·84	158	,,	Killybegs, Rockmount.	3.73	85

Climatological Table for the British Empire, February, 1932

STATIONS	PRESSURE Mean of Day M.S.L. mb.	PRESSURE Diff. from Normal mb.	TEMPERATURE Absolute Max. °F.	TEMPERATURE Absolute Min. °F.	TEMPERATURE Mean Values Max. °F.	TEMPERATURE Mean Values Min. °F.	TEMPERATURE Mean Values ½ max. and min. °F.	TEMPERATURE Mean Values Diff. from Normal °F	TEMPERATURE Mean Wet Bulb °F.	Relative Humidity %	Mean Cloud Am'nt 0—10	PRECIPITATION Am'nt in.	PRECIPITATION Diff. from Normal in.	PRECIPITATION Days	BRIGHT SUNSHINE Hours per day	BRIGHT SUNSHINE Percentage of possible
London, Kew Obsy.	1031·5	+15·5	47	25	42·3	33·6	37·9	−2·2	33·9	84	7·9	0·17	−1·37	4	1·6	16
Gibraltar	1016·7	−3·3	64	39	58·6	47·7	53·1	−2·8	48·1	83	6·7	10·83	+6·61	19	..	..
Malta	1016·0	−0·1	67	41	56·5	48·3	52·4	−2·9	48·1	77	6·6	5·01	+2·81	17	5·9	54
St. Helena	1013·4	+0·8	71	59	68·0	60·3	64·1	−1·8	60·9	92	9·5	1·78	..	18	..	..
Sierra Leone	1012·5	+1·7	89	71	86·5	75·5	81·0	−1·3	76·2	83	4·1	3·74	+3·44	3	..	..
Lagos, Nigeria	1010·2	+0·5	92	70	88·5	76·2	82·3	−0·2	76·6	84	4·8	0·44	−1·46	3	7·1	60
Kaduna, Nigeria	1012·2	−1·2	99	51	92·3	58·9	75·6	−1·3	59·9	42	2·6	0·13	+0·11	1	9·3	79
Zomba, Nyasaland	1007·0	−0·9	86	59	80·9	64·3	72·6	+0·6	..	74	6·9	5·17	−5·48	14	..	..
Salisbury, Rhodesia	1010·0	−0·8	85	53	78·9	59·9	69·4	+0·6	63·2	77	7·5	3·85	−2·97	15	6·2	49
Cape Town	1012·7	−0·7	101	57	81·5	64·1	72·8	+2·5	64·9	76	3·7	2·02	+1·44	9	..	..
Johannesburg	1010·1	−0·7	87	48	75·2	56·1	65·7	+0·1	58·1	73	5·4	5·27	+0·05	18	7·1	55
Mauritius	1009·2	−1·8	88	69	84·7	73·2	79·0	−0·3	75·4	75	6·8	4·46	−3·94	26	6·4	50
Calcutta, Alipore Obsy.	1012·9	−0·4	91	53	83·3	60·9	72·1	+0·9	61·6	84	2·7	0·25	−0·74	1*	..	..
Bombay	1012·4	−0·3	93	65	84·7	69·3	77·0	+1·3	66·4	71	1·6	0·00	−0·03	0*	..	..
Madras	1012·6	−0·3	92	63	86·3	69·4	77·9	+0·2	72·0	81	3·1	0·69	+0·39	1*	..	..
Colombo, Ceylon	1011·9	+1·1	90	62	85·8	69·9	77·9	−2·5	74·4	75	3·9	3·59	+1·65	7	9·2	77
Singapore	1010·6	+0·4	90	70	88·1	72·3	80·2	0·0	75·5	77	6·1	5·12	−1·50	11	7·6	63
Hongkong	1019·7	+1·1	75	44	60·9	53·6	57·3	−1·8	52·7	75	8·5	2·53	+0·70	10	2·7	24
Sandakan	..	..	89	71	85·7	74·2	79·9	−0·3	75·8	83	..	15·75	+4·78	15	..	..
Sydney, N.S.W.	1011·7	−2·2	101	53	77·9	65·0	71·5	+0·2	66·0	67	6·0	5·61	+1·41	13	8·2	61
Melbourne	1013·3	−1·2	93	43	74·8	56·3	65·5	−2·1	59·2	68	7·1	2·64	+0·93	12	5·6	43
Adelaide	1014·5	+0·3	97	48	79·4	57·7	68·5	−5·5	58·4	48	6·0	1·40	+0·68	8	7·3	55
Perth, W. Australia	1014·0	+1·0	102	55	88·0	65·5	76·7	+2·6	63·9	49	3·4	0·00	−0·45	0	10·1	76
Coolgardie	1013·7	+1·2	107	47	92·8	62·2	77·5	+1·3	61·2	41	3·0	1·20	+0·35	2	..	..
Brisbane	1011·4	−1·1	94	63	87·5	69·5	78·5	+2·0	70·4	61	5·4	0·70	−5·48	7	9·1	70
Hobart, Tasmania	1010·8	−2·4	82	44	68·8	53·5	61·1	−1·2	53·8	60	7·1	1·32	−0·16	14	5·7	41
Wellington, N.Z.	1012·0	−3·8	77	48	65·2	54·2	59·7	−2·9	56·7	79	8·0	6·71	+3·57	13	5·2	38
Suva, Fiji	1007·8	0·0	92	70	86·6	75·2	80·9	+0·6	76·6	82	7·0	15·24	+4·52	23	6·9	54
Apia, Samoa	1008·5	+0·1	88	73	85·5	75·0	80·2	+1·2	77·3	78	7·5	13·70	−1·59	19	6·7	53
Kingston, Jamaica	1014·8	−0·5	89	64	85·5	66·9	76·2	−0·3	64·4	80	1·7	0·07	−0·53	2	8·9	77
Grenada, W.I.	1013·6	+0·1	88	72	86·7	73·2	79·9	+2·8	74·3	76	4·5	2·74	−0·04	23	..	..
Toronto	1015·2	−2·8	51	9	35·9	23·2	29·5	+8·4	25·5	78	6·9	1·42	−0·96	7	3·4	32
Winnipeg	1015·9	−5·9	46	−32	14·6	−3·4	5·6	+5·5	..	..	5·2	0·00	−0·74	0	..	..
St. John, N.B.	1013·2	−0·7	41	−4	25·3	9·2	17·3	−2·6	11·6	65	5·7	0·11	−3·79	2	4·8	46
Victoria, B.C.	1016·8	+0·2	55	20	44·4	36·4	40·4	−0·1	37·6	86	6·6	6·29	+3·03	19	3·9	38

*For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.

Winnipeg	1015·9	— 5·9	46	—32	14·6	—3·4	5·6	+ 5·5	..	..	5·2	0·00	— 0·74	0	..	..
St. John, N.B.	1013·2	— 0·7	41	— 4	25·3	9·2	17·3	— 2·6	11·6	65	5·7	0·11	— 3·79	2	4·8	46
Victoria, B.C.	1016·8	+ 0·2	55	20	44·4	36·4	40·4	— 0·1	37·6	86	6·6	6·29	+ 3·03	19	3·9	38